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Jan 8/83

REVIEW OF THE

TELEGRAPH AND TELEPHONE

A JOURNAL OF ELECTRICAL, SCIENTIFIC AND MECHANICAL NEWS.

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Soulless Prayers.

I do not like to hear him pray,
On bended knee about an hour,
For grace to spend aright the day,
Who knows his neighbor has no flour.

I'd rather see him go to mill
And buy the luckless brother bread,
And see his children eat their fill,
And laugh beneath their humble shed.

I do not like to hear him pray,
"Let blessings on the widow be,"
Who never seeks her home to say—
"If want o'ertakes you, come to me."

I hate the prayer so loud and long,
That's offered for the orphan's weal,
By him who sees him crushed by wrong,
And only with the lips doth feel.

I do not like to hear her pray,
With jeweled ear and silken dress,
Whose washerwoman toils all day,
And then is asked to work for less.

Such pious falsehoods I despise!
The folded hands, the face demure,
Of those with sanctimonious eyes,
Who steal the earnings of the poor.

Those sainted faces that they wear
To Church and for the public eye,
Hide things that are not on the square,
And wickedness done on the sly.

I do not like such soulless prayers!
If wrong, I hope to be forgiven;
Such prayers no angel upward bears—
They're lost a million miles from heaven.

ELECTRIC LIGHT

The Volta Prize.

The volta prize of fifty thousand francs, instituted by a decree of June 11, 1882, will be awarded in 1887 to the author of a discovery which will render electricity effective and economical in one of the following applications: As a source of heat, of light, of chemical action, mechanical power, and as a means of transmitting dispatches or treating invalids. Physicists of all nations are admitted to the competition, which will remain open until June 30, 1887. A commission nominated by the Minister of Public Instruction will be charged to examine the specified discovery. The report of the commission will be published in the *Journal Officiel* of the Government at Paris.

The Brush Storage System.

The storage batteries constructed by Mr. C. F. Brush, the electrician, for use in connection with the incandescent lamps of the Swan system, were publicly shown recently at the offices of the Brush-Swan Electric Light Company, No. 853 Broadway. They are now ready for practical use, and the company is ready to put in the incandescent electric light along any of the streets through which their main cables run, for the same price that is charged for gas. The essential feature of all storage batteries is found in the apparatus invented by Gaston Plante, a Frenchman, who discovered some twenty years ago that a lead plate immersed in acidulated water was capable of absorbing a certain amount of electricity and giving it out again. At first the plate could store up but a small quantity, but after a few months of charging and discharging its capacity for storing electricity increased at a rapid rate. Plante was not a man of business, and declined to take out a patent upon his discovery. Many variations in the disposition and shape of the plates have since been patented as offering valuable improvements, the most noted of which is that of Faure, who, observing that the lead plate of a good battery became coated with oxide of lead, applied oxide of lead to his plates, and found that in this way he could make a battery without resorting to the tedious process of charging and recharging the plates for months before the storage property of the battery was developed. Faure has a patent on his process, and an American company owns the right for this country.

Mr. Brush claims the invention of a process of effectively preparing his lead plates without any oxide of lead at all. His method is a secret one. He said recently that his battery was superior to that of Faure, for the reason that there was no coating of minium on the plates to fall off, the battery could be charged more quickly and discharged more safely, and the process of manufacture was no more prolonged or costly than in the case of Faure's apparatus. The batteries shown recently were contained in a box eight feet long, fifteen inches wide, and sixteen inches high. They had been charged from an arc light circuit wire, and were used to feed twenty-eight Swan lamps of sixteen-candle power, and to run a small motor of one-horse power. This series of twenty, each cell consisting of two lead plates, about fourteen inches square in size, was sufficient to supply from forty to sixty Swan lamps of sixteen-candle power, or as many lights as a good-sized house would require. In connection with Swan lamps, one-horse power, if used to run a dynamo connected with a battery, will store up sufficient electricity to run from nine to ten lamps. That is to say, that if a five-horse power engine is used to charge the battery, it will in one hour store up sufficient current to run ten lamps for five hours, or fifty lamps for one hour. This current can be taken from an arc circuit without interrupting the burning of arc lights; the batteries are placed in the cellars of each house where the light is furnished. Mr. Brush says that the batteries are indestructible, and improve with age, the only attention necessary being the addition of water every few months to take the place of that which has evaporated.—*Ex.*

Rapid Progress of Edison's Light.

Major Eaton, the President of the Edison Electric Light Company, was asked recently how the work of the company was going on, and replied that while there were the usual number of troubles and disappointments concerning certain details of the work incidental to all new enterprises, the essential features of their system had fulfilled all the hopes that had been entertained with regard to them.

"People," said Major Eaton, "often come here and want to know why the whole city, or the down-town district, at least, is not dotted with our lights. They do not realize that in three years we have done more for the introduction of the electric light than the gas companies did in the first fifteen years toward the introduction of gas. The work is one requiring time, for many of the problems which confronted us were new, and we also had to educate our men. The great difficulty with our down-town station proved to be one that no experience could have foreseen—namely, that our engines would not work in perfect unison. After several months of trial we have determined to replace them by others, one of which is already in position. The constant experiments which have been made to improve the running of the engines have retarded our work down town, made the light uneven, and have tried our lamps more severely than a steady current would have done. But notwithstanding our troubles the lamps already put in have been supplied with electricity without a moment's break since we began to furnish light last September. In the middle of October we were lighting 85 houses, containing 2,000 lamps. To-day we are lighting 226 houses with 5,053 lamps, of which an average of 3,000 are in constant use.

"We have now begun to charge a fixed price for the light, our charge being at the rate of $2 for one hour's light equal to 2,000 candle power, or, to put

it in a shape more easily understood at present, our charge for light is about equal to the cost of gas at $2 a thousand cubic feet. We are putting our meter bottles in as fast as we can make and test them.

"The business of putting in isolated plants for electric lighting has gone on faster than the introduction of our public system, because one plant is only a repetition of another nearly similar plant. We have now 154 plants in the United States, employing 29,192 lamps. The business began a year and a half ago, and since that time we have not once failed to satisfy the purchaser. Not one of our plants has been discontinued, but on the contrary fourteen plants have been increased—quadrupled in certain cases. In this city the Thurbers' store in Reade street, the *Herald* building, and the *Times* building are among the well-known places where the light is furnished from isolated plants.

"In Boston we have 650 of our lamps in the new Bijou Theatre. The footlights have been done away with, the lamps fringing the proscenium arch and giving a more beautiful light than was ever obtained with gas. The actors are delighted with it because the air in the house remains comparatively pure. These lights can be turned up or down at will. The work of putting in the boilers, dynamos, wires, and lamps was done in thirteen days. The engines and dynamos are in a building 550 feet away from the theatre."

The Double Induction Motor.

MANUFACTURED BY THE ELECTRO DYNAMIC COMPANY OF PHILADELPHIA, PA.

The necessity which compels women to use a sewing machine has created an imperative demand for a domestic motor. And it is required not merely as a luxury for the healthy and rich, but as a remedy for the insidious and inevitable disease which follow the use of the sewing machine. It has long been admitted that human power is an extravagantly costly force, especially if pale faces, languor and doctors' bills are thrown into the scales! The requirements of a successful domestic engine have never been met until now. And it is only after many experiments and long practical tests in different households that we venture to meet the wants of the public in offering the DOUBLE INDUCTION MOTOR.

It is free from any danger of explosion—a peril attendant upon the use of heat or fire. Its portability is great, as its weight, when running complete, does not exceed 2½ pounds. It is durable; free from any danger of becoming disarranged. It affords a motion which can be stopped, reduced or accelerated instantaneously by an almost unconscious pressure of the feet. It is nearly noiseless; is very small and ornamental in appearance. It is an electrical engine, constructed on the new DOUBLE INDUCTION principle, giving an almost incredible *economy* of power. Four motors, weighing 2½ pounds each, have been tested to over two-thirds of a horse-power. The Automatic Household Battery, which is a part of the apparatus, is handsomely inclosed, and seldom requires attention, except the occasional supply of a chemical preparation—say once or twice a year in small families—and proportionately for greater use.

With one of the Automatic Batteries, our motor gives a maximum speed on the ordinary double-thread sewing machine of 800 to 900 stitches a minute, and can be regulated in speed to run between 15 stitches a second and 15 stitches a minute. The machine is interchangeable in all its parts, facilitating repairs in case of accident, but as its construction is simple and durable repairs will seldom be required. Each machine is thoroughly tested and inspected before leaving the manufactory.

Determining the Ohm.

Joule employed a calorimetric method for determining the ohm; and M. G. Lippmann has recently described another method differing from his in only requiring that quantities of heat should be measured, and not necessitating the use of Joule's mechanical equivalent, the exact value of which is to some extent uncertain. A wire of known electric resistance r is placed in a vase arranged as a calorimeter in the midst of an enclosure kept at a constant temperature. A current of intensity i is then sent through the wire. On waiting till the vase attains a stationary temperature (as can be told by plunging a thermoscope into it) the current is cut off, and a motor is set to work rubbing the bottom of the vase until the heat developed in this way just supplies the place of that before developed by the current. We have then $r\,i^2 = T$, where T is the work expended; and from this we get the value r. The friction apparatus ought to be placed inside the vase, and permit of the exact measurement of T. In practice it is more convenient to begin with the friction and find the value of i, which compensates the temperature produced by it. Joule's method involves two calorimetric observations—to wit, that accompanying the determination of E, and that accompanying the passage of the electric current. These carry their own errors with them, and hence M. Lippmann considers his method preferable.

Pure Carbon for the Electric Light.

The manufacture of carbons free from ash can be accomplished, according to Jacquelain in *Comptes Rendus* (xciv. 873), by passing dry chlorine gas over pulverized coal or coke heated to bright redness. All of the silica, alumina, and magnesia, as well as alkalies and metallic oxides, would be converted into volatile chlorides and expelled; even the hydrogen is driven off as hydrochloric acid.

The easiest method of carrying out the process on a large scale is to allow the dry chlorine gas to act upon gas carbon (from the retorts) cut into thin prisms for thirty hours, and then raise the temperature to a bright white heat. This makes the carbon porous, and in order to convert into a dense, heavy carbon, which is a good conductor and not easily combustible, the vapors of heavy tar oils (dead oil?) are passed slowly over these pieces of glowing carbon, when a deposition of carbon will take place within the pores of the coke.

If the carbon rods are treated with fused sodic hydrath (caustic soda), the silica and alumina will be dissolved as sodic silicate and aluminate, and can be removed by washing with hot water. Oxide of iron and other constituents of the ash are removed with hydrochloric acid followed by pure water.

The simplest process recommended by Jacquelain is to leave them for two or four days in dilute hydrofluoric acid, at ordinary temperature, then wash well and expose for a few hours to a slow current of tar vapors at a high temperature.

Electroliers for the Electric Light.

On Wednesday evening we paid a hurried visit to the works of Messrs. Verity & Sons, of King street, Convent Garden, the well-known artificers in ornamental brasswork. The firm also acts as agent for the Edison system of electric lighting, and on the evening in question the members of the Board of Trade representing the Strand district were present to examine the system, which was explained by Dr. Fleming, Electrician to the Edison Electric Light Company. A 60-light (nominal) dynamo-electric machine was keeping in operation 75 lamps. Next week we hope to do justice to the exquisite display of electroliers manufactured by Messrs. Verity & Sons, by far the most complete and extensive we have yet seen.—*London Electrical Review.*

Secondary Batteries.

To the Editors of the Electrical Review.

DEAR SIRS,—At one of the last meetings of the Academy of Science, Paris, M. G. Planté described a new method of forming secondary batteries, and being now actively engaged in the practical applications of accumulators, I thought that a few remarks might interest your readers upon this method. Following the recommendation of M. Planté, I have myself experimented this method at the laboratory of M. de Kabath, Paris, and regret to say, with all due respect to the great scientist and *savant*, that I cannot agree with his conclusions.

This method, as well as the one previously proposed by M. Planté, viz., of heating the solution while the elements are being formed, do not present any real practical advantages. No doubt, both methods, as applied to the formation of a Planté cell, will quicken such formation, but reducing the lead, either by heating the solution or attacking the surface of the lead by strong nitric acid, seems to me to upset the very aim pursued through the whole scientific researches of M. Planté.

In producing an artificial formation of peroxide and reduced lead, the new Planté cell will follow the same physical and chemical laws as do all other secondary batteries where the formation of the peroxide and reduced lead are mechanically attached.

One of our leading scientists, who was the first to indorse M. Faure's invention in the scientific world, has on several occasions expressed his opinion that, while by adding the peroxide mechanically the first results of a secondary battery so formed are exceedingly satisfactory, yet the action of the current, combined with the action of the sulphuric acid penetrating to the heart of that mechanically-attached peroxide, at a given moment (which we might consider as about two months for a secondary battery in active service), produces a new action of the current on the lead blade itself, which then gets peroxidized on its entire surface with a layer of crystalline peroxide, as can be distinctly seen in all the batteries deriving directly from M. Planté, in which the formation is made by the sole action of the electric current. This layer of crystalline peroxide by its molecular formation being entirely different from the peroxide mechanically attached, they become by the action of the current independent of each other; and as the oxide, when not in direct contact with the metallic blade, is virtually a non-conductor, it becomes in such a case an useless element and a dead weight.

I thought it necessary to give these remarks before expressing any definite opinion upon this new method of forming secondary batteries as described by M. Planté, and which throws us back to all the defects of the batteries wherein the peroxide is mechanically attached, for a layer of peroxide obtained by charging the molecular formation of the lead will follow exactly the same laws.

To conclude, I will say that all the tests that have been made by myself and others have fully demonstrated that, as long as lead will be used to form the elements of secondary batteries, *the only safe and practical way of forming the layers of peroxide is by the action of the electric current itself.*

The only recommendation I can make is to use 20 per cent., even 25 per cent., and sometimes even as high as 30 per cent. of acid, instead of 10 per cent., as has been adopted by M. Planté.

This solution cannot be applied where felt, parchment paper, or any other similar perishable substance is used, and from this I conclude that the

problem at present to solve is to obtain *the maximum surface to the minimum weight of lead.*

Respectfully yours,

Barcelona, Spain. CHAS. W. FARQUHAR.

Con-Science Extraordinary.

To the Editor of the "Review."

SIR,—Mr. T. D. Lockwood, in his article called "Science Extraordinary" (I amend the title, a little, above), in your issue of Dec. 15, 1882, says, that I am the author of the statement that a current from an electric light wire will run down a stream of water from a hose and kill the fireman at the nozzle. His remarks thereupon are almost as funny as his book on the "telephone," which only needs bad spelling to make it rival anything Artemus Ward ever wrote. I fear Mr. Lockwood labors under chronic disability to state facts correctly, and that the present case is another example thereof, the truth being that I have never made, written or published the assertion he imputes to me.

It was printed in the *New York Herald* originally, I do not know on what authority. An *Evening Post* reporter happening to call at my office for information regarding the accident to the lineman, had his attention called to the *Herald's* article as rather a curious and amusing view of electric light dangers. By some misapprehension he gave me credit for inventing the idea. The English papers copied the article, credit and all, and embellished it. But now, "Allah be praised," after Mr. Lockwood's vivid decorations, nothing further is possible.

234 Broadway, New York, PARK BENJAMIN.
Dec. 18, 1882.

Buying Light by the Box.

Electricians are struggling hard for the reward which the solution of the problem of the introduction of electric light to general use will secure, and several schemes seem to have the assurance of a measure of success. But the storage system, which has attracted especial attention during the two years since M. Faure's wonderful discovery, is rapidly gaining favor, and developments are progressing which promise the people of New York an opportunity ere long to buy electric light for their houses by the box. If the scheme is as successful as its projectors expect it to be, it will eliminate the element of danger involved in stringing electric wires through the buildings of the city, and make the use of electric light more convenient as well as safer. Buying electricity by the box will be more convenient even than was buying kerosene by the can in the days when that oil was the luminous wonder of the world.—*Mail and Express.*

THE TRANSMISSION OF MOTIVE POWER.—We read that MM. Piette and Krizik, the inventors of the well-known "Pilsen" arc electric lamp, have, at an agricultural gathering at Lundenberg, in Germany, been driving an ordinary threshing machine by electricity, and illuminating at the same time the yard in which the machines were exhibited.

Patent Law in Switzerland.

The proposed introduction of a patent law, which has been universally believed to be accepted, has met with a refusal by a public vote of the 30th of July. Switzerland and Holland are now the only countries in Europe which have no patent law. It must be acknowledged that the Swiss are not quite without reason in not accepting a patent law. Foreign patented or non-patented articles, in consequence of the low duties, meet with no difficulty in importation into Switzerland, while Swiss articles can, on account of the high protective duties, only in rare cases enter the neighboring countries. As long as these abnormal circumstances exist, Switzerland is not likely to give foreign products an additional protection by patents. —*Chem. Zeit.*

The Bankers' and Merchants' Telegraph Company.

The Governing Committee of the New York Stock Exchange has added to the regular list 3,000 shares, of par value $100 each, of the Bankers' and Merchants' Telegraph Company. The application to the Exchange states that the authorized capital of the company is $1,000,000, of which only the $300,000 listed has been issued. The company was organized March 23, 1881, under the general laws of the State of New York. Its route is from New York to Washington. There are completed and in operation between New York and Philadelphia, of pole line, 120 miles; of wire, 1,350 miles. There are now in process of construction, and under contract to be completed December 14, 1882, 155 miles of pole line between Philadelphia and Washington. The legal steps necessary to the extension of the lines of the company from New York to Boston have been taken, and such extension is being made. One-fourth of the shares were issued at $100, one-fourth at $110, and one-half at $120 cash.

The statement puts the amount expended in construction to Oct. 18, the date of the application, at $223,741. Twenty-two thousand dollars Texas Pacific first mortgage bonds deposited with the Trust Company in Philadelphia to enable the company to conform to Pennsylvania laws cost the company $22,825; cash on hand called loans, $90,516. The cash items are stated to be $30,000 in excess of the estimated amount required for the completion of the extension to Washington. The company has paid from its net earnings two quarterly dividends of two per cent. each. The application states the income of the company as about $130,750 per annum, $127,500 being from leased wire. The names of William W. Maris as President, and A. W. Dimock as Vice President, are affixed to the application.

The Hartford Engineering Company is about to begin the manufacture of a new electric lamp and dynamo, the invention of Mr. Schuyler, who is now the electrician of the new Schuyler Electric Light Company, of New York. The new machine and lamp have been thoroughly tested, with very favorable results. The lamp is of the pure arc type and gives a verv steady light. The dynamo is described as extraordinarily light running, and "giving five good lights with a half-inch belt."

Electrical Power Storage Company (Limited).

We are informed that the Electrical Power Storage Company (limited) will, from the 1st January next, be prepared to receive application for the supply of electrical accumulators for lighting or motive power, or for the undertaking of complete installations of electric lighting of districts, private houses and establishments, railway trains or ships.—*London Electrical Review.*

The Telephone in Germany and France.

So far back as November, 1877 (according to a recent statement by Herr Unger), did the German Postal and Telegraph authorities begin the use of the telephone in small places; and there are now 1,280 such telephone offices in the country. The public was slow to adopt the telephone for local traffic in large towns. Mühlhausen was the first to act, and a few months later, in April last year, telephone traffic was begun in Berlin with eighty-seven subscribers. The number of conversations by telephone in Berlin is now increasing by about 6,000 a month. Telephone systems are also now at work in Hamburg, Frankfort, Breslau, Cologne, and Mannheim; and in Altona, Barmen, Elberfeld, Hanover, Leipsic, Magdeburg, Stettin, Strasburg, Bremen, and Dresden they are contemplated. In the first seven towns, the telephone wires have reached a total length of 3,147 kilometers (say 1,966 miles). Berlin comes first, with 1,554 kilometers; then comes Hamburg, with 911 kilometers; Breslau, with 200 kilometers; Frankfort and Mannheim, each with 163 kilometers; Muhlhausen, with 87 kilometers; and Cologne, with 69 kilometers. The total number of applicants in these seven towns, in the end of December, was 1,694, and the number increases every week. One thousand four hundred and thirteen had been put in communication; Berlin had 668, and Hamburg 523 applicants. There are three central stations in Berlin, in Französische, Mauer, and Oranienburger streets respectively. From *data* in the first three weeks in December it appears that, on an average, 1,650 connections were made daily (on the Sunday 720, 540, and 333). From twelve to one in the busiest time; during that hour 150 connections, on an average, were made in the office in Franzosische-strasse, or five every two minutes. From three to four there is a little rest, and from five to seven fresh activity. The telephone chambers in the Exchange have double walls, with ashes, clay, or sawdust between: the inner walls have intervening a layer of thick pasteboard, then cotton-covered felt on frames, and on this the paper. These chambers answer very well, and are much frequented. There are, again, public telephone-rooms (at present two in Berlin and one in Hamburg), into which one may enter, and, on payment of fifty pfennig (say 5d.). have five minutes' talk by telephone with any one whose home or office is in the system.

Turning to France, we learn that the number of lines supplied in Paris by the Société Générale des Telephone on the 31st of January was 1,411, instead of 626 at the end of the corresponding week in 1881; and the communications in the last week of January this year amounted to 80,534. In Lyons, the number of lines has increased from 37 in January last year, to 285 in January, 1882; in Marseilles, from 32 to 153; in Nantes, from 14 to 70; Bordeaux has continued with 132; Havre with 100; Lille with 5.

George Cumming, General Agent for Berly's Electrical Directory (copyrighted), 219 East 18th street, New York City, notifies the subscribers, and those who desire to order, that Berly's British, American, and Continental Electrical Directory will be ready for delivery on or about January 15th, 1883. Size, 800 pages, royal octavo (6x10), on good paper, handsomely bound in cloth. Price $2.50 postpaid. Contains the names of all persons connected directly or indirectly in the trade, or professionally, with the science of electricity in Europe and America. The plan of the work being to furnish a convenient handbook for the use of electricians and manufacturers, having, also, valuable information, tables, formulæ, lists of patents, newspapers, books, libraries, societies, publishers, etc. Address as above.

The health journals say that to retain a sound constitution a man must lie on the right side. Yes, but which is the right side? Every lawyer, preacher and editor in the country thinks the side he is lying on is the right one.—*Texas Siftings.*

A stranger in a printing office asked the youngest apprentice what his rule of punctuation was. "I set up as long as I can hold my breath, then I put in a comma; when I gape I insert a semicolon; and when I want a chew of tobacco, I make a paragraph."

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The following very interesting article on Multiple Telegraphy just received fron our esteemed correspondent Mr. Brown, we think will be of exceeding interest to many of our readers.

Multiple Telegraph.

TRANSLATED FROM "LA LUMIERE ELECTRIQUE," OF 2D DECEMBER, '82, FOR THE TELEGRAPH AND TELEPHONE REVIEW.

BY R. G. BROWN.

PARIS, Dec. 9th, 1882.—Much importance has been attached to Multiple Telegraphs, which, it is expected, will permit sending several telegrams by the same wire at the same time, and also reducing the number of wires which are becoming encumbersome for certain lines.

I will not give a description of a complete telegraph in working order, but will expose a principle that will allow the transmission of 8, 10 and maybe 12, telegraphs at the same time and by the same wire.

This new mode of transmission would not necessitate a fresh apprenticeship and each operator would use the Morse ordinary apparatus.

To understand easily the explanations I purpose to give, one has only to give, in pencil, on a card, a circle 10 inches in diameter; mark at equal intervals, nine points in ink, and number them as a clock, from left to right. Then cover the card with a glass plate, on which a circle of the same diameter as that on the card must be drawn and eight points in red placed at equal intervals.

The glass plate must then be turned over and on its up side, the red points numbered like the black ones.

Now, if the first red point is placed on the first black one, it will be seen that the other red points are more and more distant from the black points, it will be the same thing if the glass plate is slightly turned so that the second red point corresponds to the second black one, and and so forth, as the plate is turned more; and, to say a thing which has been, no doubt, already understood, but which is essential here, it will be observed that two red points could not possibly correspond with two black ones at the same time.

When the plate has completely revolved, each one of the eight red points, in its turn, will have been eight times in contact with the black points.

What I have to say now is, it will be found, already explained by the above. The black points will be replaced by metallic blades laid flat like spokes of a wheel, and insulated from one another. The glass will be replaced by a disc of metal supported by a vertical axis, and, on the inferior face of the disc, instead of the red points, eight small metallic brushes will be laid; these brushes will slide on the conducting blades just as the red points passed on the black ones.

The disc can be put in communication with one of the poles of a battery, the other pole being connected with a post over which is a little transmitting lever that will touch the post when pressed upon. This lever will communicate, by means of a wire, with the first conducting blade; the same dispositions are to be taken for the other blades, each of which will be provided with a separate transmitting lever, except the ninth, the use of which will be indicated further on. By pressing down the first lever and making the disc revolve once, eight emissions of current will be obtained on the first blade and the first brush.

The same result will be attained on the second blade and the second brush by pressing down the second lever; and also for any of the others. If all the levers were pressed down at once, sixty-four *successive* emissions of current would be obtained in the course of one revolution of the disc; the emissions would evidently be *successive*, since the blades and brushes are so disposed that only one blade and one brush can be connected at a time. The impossibility of producing two simultaneous emissions warrants the complete independence of each transmitting lever, and it is in this independence of each transmitter that lies the whole value of the principal.

This being well understood, a second apparatus, similar to that I have just described, may be placed at any distance, and the disc of both united by a wire and a battery. The blades will communicate by the earth when the levers are down. The means by which two revolving discs can be made to turn with a synchronal movement are now well known to everybody; those means should be strictly applied here.

Admitting that the discs make one revolution per minute, we shall have (8) eight emissions of current to dispose of for each blade and each brush. Now, if the first lever is pressed down at the first station, these eight currents will arrive at the first blade of the second apparatus get through the corresponding lever pressed down on its post, then through a Morse apparatus properly inserted in the circuit, and then, by the earth, will return to the first station. The Morse register receiving those eight emissions in a second, will impress eight little marks on its ribbon. These marks, it is well known, are small tangents deposited by the inked wheel on the paper; their length could be augmented by augmenting the diameter of the wheel. These little tangents placed one after the other in so short a time will be partly one on the other and form a continuous line; *in this line the operator will cut out his letters.*

A second operator will do as much as the first with the second lever and a second Morse register connected with the second blade of the other station; they will work at the same time with entire independence, and it will be the same for the third, fourth, etc., operators. Some may operate quicker, others slower, each at his leasure and according to his personal aptitude.

In this common labor, it must be observed, that in reality, the operators transmit one after the other, but as the turn of each one comes eight times in a second, if they transmit one after the other, they all operate at the same time, and that without any possible confusion, since the electric current is solely devoted to he who transmits at one moment and suppressed for all the others.

The first station being provided with Morse apparatus, and also the second, there will be no difficulty in mixing the transmissions and receptions in the same wire; the transmitting operator being assigned the same number as he who receives, on each disc.

If it were possible to give a synchronal movement to four discs, there would be no difficulty in communicating with four stations by the same wire, and thus could a number of wires become useless, be suppressed.

To insure the synchronism of the discs, Messrs. Myer & Baudot have imagined a correcting mechanism which answers perfectly. To this mechanism will be devoted the ninth blade in each disc; this blade must be placed beyond the circumference, and the first disc, provided with an appendix, will make pass on it a special metallic brush which, in its turn, will send a current to the ninth blade, also placed out of the circumference of the second disc, and connected with the corrector.

By putting eleven blades on larger discs, one being reserved to the corrector, ten operators would be in the same conditions as we have just exposed; and would transmit at the same time by the same wire, with just the same independence.

With thirteen blades, could twelve operators transmit simultaneously twelve telegrams by the same wire? Perhaps.

I said perhaps, for if the brushes by passing too

rapidly on the blades did not afford the current time to pass, a great deal of its strength would be lost, and perhaps it would not have the power to give proper motion to the armatures.

But instruments much more sensible than armatures are now in use, and if, as in America, the sound of each letter was sent to the ear, it would be possible, with much feebler currents, to transmit or receive twelve telegrams at the same time by the same wire; to attain this result, it would suffice to provide each operator with a transmitting lever and a telephone; this would be much simpler and less expensive than the Morse apparatus.

However, another difficulty presents itself here: Would it be possible to obtain perfect synchronism of movement for two discs effecting ninety-six revotions per second, carrying eight metallic brushes and receiving, at the same time, ninety-six emissions of current, everything would be mixed up if the second disc was $\frac{1}{96}$ of a revolution late or fast.

These are the only reasons which would prevent the number of telegrams sent at the same time, being increased; and if one hundred and twenty-eight emissions sent by the sixteen blades of a first apparatus, in the space of one second, could divide themselves exactly between the sixteen blades of a second apparatus, it would be possible to transmit sixteen telegrams at the same time and by the same wire.

I have observed since a long time, that a rubbing contact does not afford a regular passage to the electric current; simple contact is more effective; this may be tested by the following experiment: Take such dispositions as are requisite to send a current through the inducing wire of a small induction machine; and, after having taken in both hands the ends of the induced wire, establish the communication by a spring put in contact with a cylinder, one shock is felt and that is all, though the current continues to pass; but if the cylinder is made to turn, a number of shocks are repeatedly felt, sometimes the repeated shocks being as violent as the first, which proves the irregularity of the current.

The metallic brush could be replaced by two small metallic wheels fixed each at one extremity of a spring; they would turn instead of rubbing and the motion of the discs would be much easier.

If the corrector invented by Messrs. Baudot & Meyer could not be adapted to the instruments I have just described, this is what I should propose:

The ninth blade and its brush will be used to send a current in the second apparatus.

An electro-magnet with a flat cone will receive the current, and will replace the ninth blade of the second apparatus.

A blade of soft iron fixed on its edge to the border of the disc, and forming like the continuation of the spoke, will pass over the electro-magnet at the moment the current is sent to the latter; but the blade will not feel the effect of the attraction, for a vertical piece of metal fixed to the disc will lift a movable contact and break the circuit. This is what will occur when there will be perfect concordance between the discs; but, if the second is a little late, the movable contact not yet lifted will afford passage to the current, and, for a very short moment, the blade of soft iron will be attracted forward.

If, on the contrary, the disc is fast, the contact, which will have fallen back in its place, will complete the circuit, and the blade of soft iron will be, for a moment, attracted and kept backwards. In this system there is no mechanism liable to get out of order, and the double action, operating in good time, will, I have no doubt, be sufficient to preserve the synchronism of the discs.

Mr. John M. Wheeler, of telephone fame, is spending the holidays in the quiet city of Toledo, at his old home.

The Central Office Manager.

With fear and trembling our pen takes up this hitherto unexplored territory, and essays to detail for the benefit of the world at large and especially for the telephonic portion thereof, a few of the customs and habits of the central office manager; his idiosyncracies and ways. It is with no desire to ridicule this high and holy profession, that we here record the characteristics of various general and species of the manager. No one who fills, has filled, or expects to fill that exalted position, or who has much to do with the average incumbent of the said position, can honestly and truly gainsay the statement, that there are both bad and good exchange managers; and the fact is equally patent, that there is but one grade of "perfect managers," while the grades of imperfection are legion. Necessarily, therefore, we shall have much more to say of exchange managers who are not perfect, than those who are; of the peculiarities of the former class; the tricks and toils that in them lurk, and the ways and wiles they love to work: for they that are whole, need not a physician; but they that are sick. And with due regard for the good of the cause, with love toward all, and malice to none, we now proceed, knowing that though our pen be feeble our intentions are good.

Let us look first at the tyrannical central office manager. He is a nice man; and wears good clothes, an immaculate shirt bosom, and a strictly correct tie of early English neutral tints. He prides himself on the rigid discipline, in which he maintains his force; and well he may, for he has nothing else to pride himself in. The hours of labor of his operators are divided up geometrically, and our manager makes a point of being always in the office, when any operators are to be relieved, so that the relieved ones (and what a meaning in this case attaches to the word) will not dare to evince an undue anxiety to leave, for that is the unpardonable sin. On the contrary, the relieving operators must always be on hand, five minutes before the hour, so that they may readily take hold of the business.

It is not, however, so much the matter, as the mannner of these observances that renders them odious. Instead of "Come On" being his watchword, it is "Go On," for while acting the uttermost title of the Draconian code, from his subordinates, he ever keeps a laudable look-out for Number One. He believes in ruling by fear exclusively, and he also believes that faith without works is dead. He generally singles out some unfortunate youth, who has no friends, as a special object of tyranny, and he makes that youth's life a veritable misery; all the worst jobs are his; battery cleaning in abundance falls to him, and he is made a hewer of wood and a drawer of water for the crowd. The tyrannical manager emulates Squeers of Dotheboys Hall, in his conduct to this unfortunate and others, and "*w i n win, d e r der, winder, go and c'ean it*" is a matter of daily occurrence in this office. Let it not be supposed by any one that all this accelerates business, or causes it to be advanced in any way.

Discipline cannot be too highly spoken of; tyranny cannot be too strongly condemned. In an office cursed with such a manager as we have depicted, changes in force are frequent, to the detriment of the service; such changes being due both to frequent arbitrary and undeserved dismissals, and also to frequent resignations on the part of operators, with whom forbearance has ceased to be a virtue. Where changes in force are unreasonably frequent, it behooves superintendents or general managers to investigate, and, if an embryo Nero be found in the operating room, he should be made to stand not upon the order of his going, for in union there is strength; and the manager of an operating room, who merits not the respect, honor, and good feeling of his associates, can never be a success, no matter what his other qualifications are. When he goes, it is not likely that he will be presented with a gold watch as a memento of their undying esteem.

Let us try another brand. We have seen once or twice what we may, for want of a better term, classify as "the susceptible manager." It doesn't take the operators of the gentler sex long to find him out, for he wears his heart upon his sleeve for daws to peck at, and no mistake about it.

We may do him the justice to say that, usually, he knows his weakness and tries to avoid it. It is perfectly useless for him to make any such attempt, however; for, even though he fill his operating room with the plainest specimens of feminity that are procurable, this miserable and much-to-be-pitied man will find too late that one, at least, of the crowd, even though she be plain, still is fascinating and entertaining.

This type of manager is usually a very young man, although sometimes he may be pretty well advanced into old bachelorhood. It may at first sight be supposed that he is just the man to rule young ladies, and that he may be able, as the hymn says, to prove that it is better far to rule by love than fear; and, no doubt, the hymn is correct in a general way, but it is sadly out in this case. It is all well enough for the operators to love the manager, but the manager mustn't love the operators, or, if he does, he must love them all alike, which a susceptible manager, in the very nature of things, cannot do. First thing you know, he has found out that Miss Bella Donna has a very lovely and rapid handwriting, and that, of course, is a good reason for Mr. Tenderheart to appoint her to the position of secretary and amanuensis to himself, with short hours and other favors to correspond; equally, of course, that is what the other Eves of his garden cannot and won't stand, and there is trouble.

Or Miss Sallie Moniac becomes very attractive to Mr. T., and all at once her section of switchboard develops an extraordinary tendency to get out of order, and require an abnormal amount of personal supervision on the part of our hero, and this lasts for an indefinite period.

Or Miss Annie Mation ascertains that Mr. Tenderheart's wealth of affection is temporarily centered upon her, and being somewhat of a worldly disposition, and moreover engaged to another Leander, she plays him for all he is worth, and gets the largest liberty and an afternoon off to go shopping whenever she feels like it; and so on *ad libitum*. A susceptible man is decidedly out of place in a telephone central office, for no man can serve two masters. Where Cupid holds sway, the interest of a man's legitimate employer is at a discount.

Next. The "*easy-going manager*," what shall we say of him? Nice fellow, but no success. Like the eldest son of the patriarch, "unstable as water he shall not excel." Above all things he hates trouble, and acts upon his hate; and a telephone man who objects to trouble might as well quit the business, and go to be gentleman's gentleman to some wealthy foreigner. An annunciator is reported out of order by the diligent operator; "All right," drawls our friend; and then to himself, "What a confounded nuisance," and after a few stretches and jaw-breaking yawns, he gets up, and commences to lounge across to the defective instrument. Before he gets there, however, somebody comes up, and asks him if he has seen Langtry? and what between Langtry, and other equally interesting subjects, extraneous to telephony, he forgets what he was going for, and presently we find him back in his easy-chair; when the affair is reported again, with a request from the executive office that he explain the delay, he is fain to say that the customer didn't report the trouble; which is true enough, albeit the operator did. But the operators all like Mr. Pacificus, because he is

very lenient with them, and hates to say "No," whatever they ask him, and they will never say anything that may get him into trouble. It is just so in everything. He will always say, and think if he does not say, "Time enough." If there is line trouble he never reports it till he has to. If changes are to be made in the tower, he never makes them until they have multiplied, so that instead of making one change, he has to make a hundred, and to do that, leave his flock shepherdless the biggest part of a day. If all the operators ask him for an afternoon off, he will say "Yes" to all—and not realize what he has done, until he finds that for once he has himself to work, and to work hard, to keep his desolate condition from being known. Needless to say chaos reigns unrebuked in this man's office, and no discipline is there to be found. Operators come when they please, and go as they please; in fact, the whole concern degenerates into a kind of go-as-you-please match, and every one except the manager seems to be engaged in trying "how not to do it," and to succeed very well, he, by the way, seeing the evil, but too good-natured to stop it. Nothing short of a sharp lesson will cure the easy-going manager. If he gets that in time he may be cured, and if cured will become one of the most rigid disciplinarians imaginable. Till he is cured he is no good. We pass to the non-electrical manager. His chief pride is in the fact that he knows little or nothing about electricity—and yet, see how well I get along; and so in truth he does, simply owing to the fact that as he must necessarily leave all his electrical work to other persons, who are presumably qualified for such work, he has abundance of time to look out for the *morale* of his office.

If he knows that he knows nothing about electricity and electrical connections, and if there are proper persons to attend to technical matters, he may be a first-class manager—provided he is a good manager otherwise—for it is frequently far better to have a sensible, just, and square man, who is not an electrician, than a brilliant but erratic electrical expert, for a manager.

Let him not think within himself, however, and boast that his success is a consequence of his lack of technical knowledge; let him rather believe the truth, that it is in spite of such a lack that such a measure of success is attained, and that it behooves him to become increasingly valuable by applying himself to acquire a sufficient amount of electrical knowledge to enable him to make any slight repairs, or to make any changes that may from time to time become necessary.

Turn we to "the chronic inventive office manager." This specimen may be otherwise good, but that is hardly probable, for the chronic inventor as a rule cannot do anything else. He must invent or he will die. He cannot for the life of him conceive how Bell came to invent the telephone, and that he did not, "so easy it seemed, once found; which yet unfound, most would have thought impossible." One day he invents a new switchboard, and cannot see why his employers do not instantly discard the present one, for which they have just paid fifteen hundred dollars, and substitute his. Next day he will get up a wonderful telephone, which he will loudly assert to be independent of the Bell patent, and which he will offer to the Bell Telephone Company for one hundred and thirty thousand dollars, cash; reserving Canada and all foreign countries. The third day he perhaps will get up a new lightning arrester, and in trying to fit it to his lines it is suddenly discovered that no calls have come in for an hour. As a substitute for the missing calls, there come, however, a noble army of complaints, that "I can't raise the central office;" and just as he thinks, "good, easy man, his greatness is a ripening, there comes a frost, a chilling frost," in the person of his superintendent, who says, "Mr. Knowtoomuch, unless you can leave these playthings and attend to your business, we shall have to part."

And it is even so. Unless we do what we have to do, and do it with all our heart, and do it well, we cannot hope that our employers will appreciate and value our services. If a man is engaged to manage an operating room, that is his work, and he ought to do it. If a palpable improvement crosses his mind, it is equally his duty to avail himself of it and work it up, but not to the detriment of his regular work. Inventors are to be found in plenty; good, capable men, who do well what they are required to do, are rather scarce. It is well to unite these qualities. If we have but one, let it be the latter.

Did you ever meet the "don't know manager?" I have—he don't know the number of his subscribers, the grade of his linewire, how to adjust a transmitter. He thinks magneto bells work by frictional electricity; if you ask him to cross connect 92 with 345 he will meet you with a stony British stare. He doesn't understand the use of a switchboard; he cannot instruct new operators, because he doesn't know anything himself; he thinks an escape is caused by the wire being broken, and that an ohm is an English equivalent for an home. When he sees a battery, he wants to know if it is loaded. He has been in the office for eighteen months, and yet he has the impression, that the sound is actually transmitted over the wire *à la* speaking tube.

He doesn't know any of his operators' names, or where they live; he regards a lineman or an inspector, as a kind of strange animal, and, worse than all, he thinks he does well not to know. He is a graduate of Yale, was perhaps stroke oar in an international boat-race, and his father was schoolmate to one of the directors. Therefore he will probably keep his position. There is one redeeming feature about this character—he doesn't do much harm.

We could talk of the "don't care" manager, who is far worse than the "don't know," and we could also tell of the manager, who wants to be engaged in everything but his own duties, and who if he could locate breaks and crosses, work at construction, solicit roof permits and subscribers, manage his operating room, and coach the General Superintendent all at once would be perfectly happy, but time and the midnight oil fail us.

We may not leave this subject, however, without recounting the virtues of the A1 manager, who is born and not made—he who took hold of an operating room, notorious for its bad service, and made it equally notorious for good service; who, without constituting himself a second Ivan the Terrible, can maintain a firm but kind discipline. He never has occasion to threaten, because his subordinates know that what he says he means. He is particular that all employes shall be at their duties punctually, and also that they shall be relieved punctually. He never makes preferences, but treats all with unvarying and just equality, whereby confidence is generated between manager and operator. He insists, first of all, that calls must and shall be attended to promptly, and keeps a sharp eye for any improvement that will accelerate the business of the office. He supervises his entire office and not only a part of it.

He knows where every wire in his tower is located and can test every wire readily. He makes himself acquainted with the peculiarities of all his lines, and can tell the instant he puts his ear to a telephone belonging to a line in trouble, what that trouble is.

He never undertakes to readjust a Blake transmitter because an annunciator drop won't work.

He likes to know the reason of any complaint from subscribers, and when any such is received, he goes for it instantly, and without waiting a few hours to see if it will leave the line spontaneously.

If any altercation arises between an operator and a subscriber, he assumes it at once, leaving the operator free to continue her work; and he insists that operators shall at once turn complaints over to him. He makes himself acquainted with every branch of his business, so that whether a wire is to be changed, a pole-changer or annunciator to be adjusted, or a switch to be repaired, he is the man to do it. While strict, he is also lenient, ever ready to extend favors to the operator who is trustworthy and unpresuming, and, in short, his whole desire and aim is to have the most efficient central office in the country, and such are the men who have been the salvation of the central office system of intercommunication.

Telegraphic.

The Subterranean Cable from Paris to Marseilles.

The laying down of the telegraphic wire, which is to put Marseilles in direct communication with the capital, is being rapidly pushed forward. Two hundred and fifty workmen are at present employed on the right bank of the Rhone, following the highroads as far as possible. The cable is enclosed in a cast-iron pipe, laid at a depth of five feet six inches under ground, the joints of the pipe being covered with india-rubber washers and leaden rings. About every 550 yards the cable passes through a covered chamber of cast iron, fitted with a manhole, by means of which it can be inspected. About every 110 yards the pipes are connected by cast-iron boxes, which also enable the wires to be inspected and repaired. The expense of the whole work is estimated at forty million francs, or 1,600,000*l*. When this line (which may be said to traverse the length of France) shall be completed, it is intended to connect it with the Transatlantic and Mediterranean cables.

Edison's Experiences as a Telegrapher.

"What were the real facts of that Boston experience you had in fast receiving a good many years ago?" Mr. Edison was asked yesterday.

"Let me see: that was in 1868. I had been working in Louisville, Ky., a couple of years, and went from there to Michigan. A friend named Adams, got me a place here in Boston, and I came over, arriving here about 4:30 o'clock, and had to go to work at 5:30 o'clock. Although it was the middle of winter I came into the office with a linen duster on, for I was very poor then. A fellow named Jack Wright, who knew me out West, thought to have some fun, so he posted the office and had New York put on an operator named Bagley at their end of the line, with a special of 800 words to the *Journal*. He had had my end switched to a table about the middle of the room, near the manager's desk. Not suspecting anything, I sat down and commenced taking it. Soon Bagley commenced to 'whoop 'em up,' and, although I was accustomed to keep six or eight words behind in copying, I thought best to close up, especially as he commenced to send some awful sticking stuff, makl's of all his m's and contracting his words, sending 'imy,' for instance, for 'immediately,' I having to write it out in full. Happening to look up, I noticed fifteen or twenty operators grinning behind me. Then I saw it was a 'put-up job,' and my blood got up and I determined I would not break. Operators in New York asked over other wires if I was getting it, and would hardly believe the replies. When I thought he had reached the top of his speed, I opened my key and said: 'Don't go to sleep; shake yourself and hurry through this!'

"The way I managed it was this: I had practiced all kinds of hand-writing, and found that by a kind of print hand I could write fifty-five words per minute, and I knew there was no man who could keep up that speed with a telegraph key, so I felt safe if I could only read the ticking. I had no fears as to that either, as I had read all kinds of 'clipped' send-

ing in the West. Another thing that was in my favor is, that I am a little deaf, so that the hum of an office does not disturb me, and I gave my whole attention to the clicking of an instrument.

"There is a little experience I had out in Indianapolis that may interest you. I was very ambitious to receive 'press report,' and used to sit up until the 2 A.M. 'press report;' listening beside the receiving operator, until after a while I could receive it very nicely, and then I wanted to receive press myself. Naturally, when I had the real responsibility of taking it, I 'bulled' it bad at first, as they sent at the rate of forty words per minute. I thought the matter over, and worked out a little plan to have the 'register' indent some tin-foil as it came in, and then had the boy turn it through another instrument, which ticked it off at the rate of about twenty-five words per minute, which I read and wrote off very easily. The only trouble was that we got '30' (good night), from the East about 2:30 A.M., while it was sometimes an hour or more later when we gave the last sheet to the newspapers. They commenced to growl after a while, and our manager dropped in on us one morning and discovered our little game in full blast.

"By the way, there were several valuable inventions wrapped up in that office trick. Talking of the tin-foil reminds me of another incident. There was a fast-sending tournament gotten up once, in which the judges were to be at St. Louis, and the fast senders throughout the State were to send from their respective offices to the central office in St. Louis. Now, although I have a reputation as a receiver, I have just the opposite reputation as a sender, and when I entered my name in the list to compete, there was great 'ha-haing' over the wires. We were given a chapter in the Bible to send, and, while the other men were practicing sending it, I worked out the chapter on the tin-foil, and fixed everything all ready to turn the crank at the rate of about fifty or fifty-five words per minute, getting our boys to keep quiet about it. For some reason the contest never came off, and I did not have the pleasure of carrying off the prize.—*Boston Herald, December* 14.

Telephonic.

Col. Geo. L. Beetle, General Agent for the Western Electric Company, has gone West on a business trip, and we learn that he will be absent some months. The Telegraph and Telephone fraternity will regret his absence.

An acceptable holiday gift for your friend in the Telephone, Telegraph or Electric Light business: A year's subscription to the REVIEW OF THE TELEGRAPH AND TELEPHONE, $2.00.

The *Edinburgh Courant* says: "The United Telephone Company have circulated a warning to anyone selling or using without their license, any form of telephone covered by the patents in the company's possession. Appended to the formal declaration that proceedings will be taken in case of any infringements to these patents are short *résumés* of cases decided in favor of the company, the chief being that against Mr. Alexander MacLean, Edinburgh, in which an important judgment was pronounced by Lord M'Laren.

THE LONDON AND GLOBE TELEPHONE AND MAINTENANCE COMPANY.—This company, having received the necessary license from the Postmaster-General, are about to begin opening telephonic exchanges in this country. We have also received information to the effect that Mr. José D. Husbands has resigned his position as general manager to the company, so that he may be able to attend to private affairs.—*London Electrical Review.*

We extract from a circular recently issued by the Mexican Telephone Co. the following interesting facts concerning the present state of the business in that Republic. It is a remarkably good showing for such a short period, and we think will surprise and interest all in that field:

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"DEC. 15, 1882.

"Having received a number of inquiries regarding the present condition, progress and outlook of this Company, the management deem it expedient at this time to issue a circular letter, detailing as briefly as possible information that may be of general interest to stockholders.

"*The Company was organized* April 21st, 1882, under the laws of the State of New York.

"*The Capital Stock* is $1,000,000, divided into 100,000 shares, of the par value of $10 each, the shares being non-assessable.

"*Rights, Franchises and Concessions.*—The Company controls exclusively the rights of the AMERICAN BELL TELEPHONE COMPANY and the CONTINENTAL TELEPHONE COMPANY for the Republic of Mexico. In addition thereto, it has received a decree from the Mexican Government, which gives it the *exclusive right* to the Telephone Exchange system throughout the Republic of Mexico, and has also obtained valuable concessions, grants and privileges from State and municipal governments.

"*Plan of Operations.*—It was decided at the outset to adopt the following plan of operations, namely: That the Company should own and operate the Exchange in the City of Mexico, carry on a general exchange and private line business in the State of Mexico, and lease the balance of its territory to sub-companies, who should pay to the parent company a proportion of their stock, and also annual royalties on each set of Telephones furnished them.

"*Sub-companies.*—Below is given a list of the sub-companies already organized, with the territory occupied by them:

The MEXICAN CENTRAL TELEGRAPH AND TELEPHONE CO., controlling the States of Guanajuato, San Luis Potosi, Zacatecas, Queretaro, and Aguas Calientes.

The MEXICAN NORTHERN TELEGRAPH AND TELEPHONE CO., controlling the States of Coahuila, Nuevo Leon, and Tamaulipas.

The MEXICAN PACIFIC TELEPHONE CO., controlling the States of Sonora, Sinaloa, Colima and Lower California.

The CHIHUAHUA TELEPHONE CO., controlling the State of Chihuahua.

The DURANGO TELEPHONE CO., controlling the State of Durango.

The PUEBLA TELEGRAPH AND TELEPHONE CO., controlling the State of Puebla.

The VERA CRUZ TELEGRAPH AND TELEPHONE CO., controlling the State of Vera Cruz.

"*Cities where Operations have been Commenced.*—The following is a list of the cities in Mexico, with the population of each, where operations have already been commenced, and exchanges are being established:

	Population.
City of Mexico	280,000
Guadalajara	110,000
Leon	105,000
Puebla	80,000
Guanajuato	65,000
San Luis Potosi	65,000
Zacatecas	62,000
Queretaro	55,000
Monterey	42,000
Colima	42,000
Mazatlan	36,000
Vera Cruz	35,000
Saltillo	25,000
Chihuahua	35,000
Durango	25,000
Tepic	25,000
Hermosillo	15,000
Guaymas	8,000

"*Population.*—It may be of interest to add, in this connection, that the total population of the Republic of Mexico is now a little over 10,000,000, and its present rate of increase is estimated to be about half a million a year.

"*The City of Mexico Exchange.*—Work was not fairly commenced on this exchange until about the first of last July, at which time it was predicted that one thousand subscribers to it would be obtained in two years. At this time the number *is over seven hundred.* More than half of these are already connected, while the others are being supplied as rapidly as possible, and at the rate they are coming in it is fair to expect that the thousand will be reached by the first of next April, or *less than one year* from the date of the organization of the company.

"*The State of Jalisco and City of Guadalajara.*—At a recent meeting of the Board of Directors it was decided, after careful consideration, that, in addition to the City and State of Mexico, the company should undertake the building and operating of the exchange in Guadalajara (the second largest city in the republic), as well as the general private line and exchange business in the State of Jalisco, of which it is the capital. The work in Guadalajara has already been commenced, and one hundred and fifty subscribers will soon be in connection with that exchange.

"*Rates of Exchange Service.*—In the beginning it was found best to charge exchange subscribers a comparatively low rental, in order to meet competition and interest the public in an enterprise of which they knew very little. Since November 1st, however, rentals in the city of Mexico have been raised to $5 per month, or $60 per year. In Guadalajara the same rates will be charged after January 1st, 1883, while all of the sub-companies receive $5 per month from their exchange subscribers. There has been no unusual complaint or fault-finding at the advance; on the contrary, the old subscribers remain, while new ones are coming in as rapidly as ever. All express themselves as pleased with the service, and Mexico, like the rest of the civilized world, is fast coming to regard the telephone as indispensable. These rates, and the royalties paid by sub-companies to the parent company ($5 per year) may seem low to some of the inhabitants of our larger Northern cities, but to such we would say, Please bear in mind, first, that the Mexican Telephone Company buys its telephones and owns them, paying only $7.40 per set, and that it receives, in addition to the $5 per year royalties from sub-companies, a large proportion of valuable stock from each one, which can be estimated to average dividends of at least from 15 per cent. to 20 per cent. after the first year.

"*Operating Expenses.*—The cost of maintaining and operating exchanges in Mexico is about half what it is in the United States, owing to the low price of labor and the extreme cheapness of living.

Private Lines.—There is a large demand for telephones for private line use throughout the entire republic, and owing to the condition of the atmosphere, long lines can be operated very much farther and better than in the United States. The prices received are excellent and the profits large. It is expected that the private line business will alone pay all operating expenses, not only of the parent company, but of the sub-companies also.

"*Dividends*—Which are always the most important consideration with the stockholders, promise eventually to be quite as good, if not better, than those of any Telephone Company in the United States. This is owing, partly, to the general condition of things in Mexico, but principally to the company's *modus operandi*, based, as it is, on the experience and observations of the workings of other companies which have been in operation since the Telephone has been put into practical use. It is safe to say at this time, that, unless some very unexpected con-

tingency should arise, a dividend of 1½ per cent. will be declared April 1st, 1883, and thereafter a quarterly dividend of not less than 2 per cent., besides which a fair amount will be charged to the Reserve Fund.

"*Unoccupied Territory.*—The following States, which comprise very valuable territory, are as yet unoccupied by sub-companies, though several applications from responsible and desirable parties are now under consideration. The leasing of these will add materially to the parent company's stock and royalty account, and consequently to its future dividends :

Oajaca,	Michoacan,
Hidalgo,	Guerrero,
Yucatan,	Chiapas,
Morelos,	Tlaxcala,
Tabasco,	Campeche.

"*Finally.*—Nearly every one is familiar with the present condition of Mexico—its sudden springing into life, its rapid growth, its numerous railroad and other enterprises, the value and development of its rich mines, which are fast being opened and so profitably worked, the fact that a tide of Americanism is setting steadily into the country, bearing with it energetic men of means and ability, with progressive ideas that are fast being shaped and moulded into the many forms existing to-day in our own busy country. Nowhere else is the population increasing so rapidly in proportion. There is truly a great future in store for our sister republic, and that very near.

"These are simple facts, and relate to the telephone as the telephone relates to all civilized life, and the management feel that they have every reason to congratulate the stockholders on the rapid progress, present condition, and bright prospects of the company.

* * * * * * * *

On Undulatory Currents.

If undulatory currents are not to the taste of certain scientific writers, who, merely casting a superficial glance at the work effected by them, make statements which are quite the reverse of those advanced by the experimentalists, we can only wonder at the simplicity of such writers, who, without forming a clear idea of their subject, believe that undulatory currents are produced solely by carbon interrupters and not by metallic ones ; which leads them to the conclusion that, since speech can be reproduced by the latter, it is not by means of undulatory currents, and consequently, that all the ideas formed as to the mode of action of microphones are so many "mare's nests." We should not have referred to these errors but for the fact that the name of Mr. Preece, a very learned and highly esteemed scientific man, has been brought in in connection with them, although he has never supported such a theory any more than Prof. Silvanus Thompson, whose champions these writers seem to have constituted themselves. These *savants* and all physicists, whoever they may be, know perfectly well, and have asserted on all occasions, that articulate sounds can only be transmitted electrically on the condition that the current should be always closed, and that its intensity should vary in proportion to the sonorous vibrations determined by the voice. Now a continuous current, which presents alternations of increase and decrease of power, is really an undulatory current, *i. e.*, a current the intensity of which undulates like the waves produced on the surface of water when a stone is thrown in ; it is on account of this resemblance that Mr. Bell has given to the currents transmitted through the telephone the name of undulatory currents. Now, M. Th. du Moncel showed, in 1856, that such currents can be obtained, either with metallic interrupters or with interrupters consisting of bodies of moderate conductivity. If the writer to whom we allude had given any thought to the discussion which has taken place between Prof. Silvanus Thompson and M. Th. du Moncel, he would have seen that the point at issue was this : M. du Moncel is of opinion that the undulatory currents resulting from the metallic interrupters are not sufficient to establish regular transmission of speech in the receivers constructed for loud speaking, since the extent of the variations in intensity of the current caused by the sound-waves of the voice is, according to his experiments, much smaller with the metallic interrupters than the carbon one, or, in other words, that the undulatory currents are much less marked in one case than in the other.

As to the question of knowing whether currents completely interrupted can reproduce speech, there is no electrician who can answer it ; but it is known to all that these interrupted currents act much more powerfully and produce, in the case of telephones, loud sounds, heard at a distance, and all over a large hall. The two modes of action can be tested by working the singing condenser of MM. Pollard and Garnier. When the transmitter is regulated so as to reproduce speech, *i. e.*, with the plates of the interrupter in continuous contact, no sound is heard, that is, unless we use the means employed by Messrs. Dunand, Herz, or Dolbear, but if it is regulated so that the current should be interrupted, the apparatus reproduces musical sounds, without transmitting speech.

Prof. Silvanus Thompson ssserts, on the contrary, that the metallic interrupters are quite as efficacious as the others, from the point of view of determined undulatory currents, and that the carbon interrupters are only preferable because they do not become oxidized by the passage of the discharge.

We will now give the reasons which prevent M. Th. du Moncel from accepting Prof. Silvanus Thompson's opinion, but we should now say that Mr. Preece has entered into the discussion only to point out the intervention of a new cause in the creation of the undulatory currents produced in the microphone. Far from denying the undulatory currents, he admits them, but he thinks that it is to the calorific action determined by the current at the point of contact of the two surfaces of the interrupter that the effect must chiefly be attributed, whereas it has hitherto been asserted that it must be accounted for by the differences of pressure, the closeness of contact between the two parts of the interrupter, or to the variations in extent of the section of the conductor at the point of contact, in consequence of irregularities in the two surfaces in contact. In opposition to Prof. Thompson's opinion, he maintains that carbon is preferable for this kind of interrupter, because it is of moderate conductivity. M. Th. du Moncel quite endorses Mr. Preece's opinion, but thinks that all the influences that we have just enumerated are at work simultaneously, to a greater or less degree, and that the predominance of any one of them depends on the nature of the microphone.

In the soft carbon microphones, like those of Edison, the predominating influences are evidently the variations of pressure, of closeness of contact, and of section; in the hard carbon instruments it is probable that the cause indicated by Mr. Preece is the most important. However this may be, and whatever importance is attached to the cause at work, the effects produced are always the same.

As to the superiority of the interrupters consisting of bodies of moderate conductivity, which M. Th. du Moncel attributes to the greater amplitude of the variations in intensity of current produced in them, he explains it in the following manner :—(1) "If we start with Mr. Preece's theory, we may say that the points of contact of the microphone becoming heated more easily as their resistance is greater, the variation in the intensity of the current should be greater with bodies of moderate conductivity than with metallic ones, since they offer greater resistance, and besides, as in bodies of moderate conductivity the variations in resistance under the influence of heat are much greater than in metals, the waves of the undulatory current produced by them must be more marked, all the more so because the variation is effected in a more favorable manner, since the effect produced by the sound-waves is to increase the conductivity of the points of contact, instead of diminishing them, as with metals ; (2) if we start from the hypothesis of the increase of conductivity effected by the drawing together of the conducting molecules, or by the increase of section, it can be reasoned out in the same manner, for the subsidence of the molecules will be effected more easily in bodies of moderate hardness than in really hard substances, and besides, in the former there are always semi-conducting particles which greatly facilitate the action, as has been shown by the experiments of Mr. Hughes, M. Bourseul, and many others." We cannot attach much importance to the oxidizing action of the contacts with the metallic interrupters referred to by Prof. S. Thompson, for according to the experiments of M. du Moncel and Mr. Hughes, the variations in intensity of current are much greater with oxidized conductors than with surfaces that have been scraped ; besides, M. Herz's best microphones are those formed of conductors composed of agglomerations of metallic filings. It is therefore perfectly clear that Prof. Thompson's arguments cannot be considered as final.—*La Lumière Electrique.*

Mr. E. T. Gilliland, of the Gilliland Electric Manufacturing Company, Indianapolis, Ind., has recently invented an improvement in railroad train electric signaling, which has all of the elements of a very great success. Renewed attention is called to it by recent failures of the present bell rope to do its duty, for it has been devised for the purpose of dispensing with the very inconvenient and cumbrous mode of communication to the engineer by which a cord passing from car to car is forcibly pulled to operate a mechanical bell affixed to the engine cab. It is proposed to substitute for the said cord and bell an electric bell upon the engine, and an effective and convenient generator of electricity in each car.

One of the very great evils attending the use of electrical signaling heretofore used on trains has been from the uncertainty of the galvanic batteries employed and the care that they should have, and which has proven to be a very objectionable feature upon railroad trains. This is remedied by the employment of a generator of electricity on what is called the magneto-electric principle, and is so arranged that each car will be supplied with a neat and simple box containing the generator, with a small bell-pull or crank handle attached, so that a signal may be instantly sent to the engineer by a turn or two of the crank, or a slight pull of the bell-pull. It will be so constructed that there can be no false signals given, and in the running of the wires or electrical circuits no additional work is necessary in making up the train, such as coupling or joining the wires or binding screws; while at the same time, should any of the cars of the train, from causes accidental or otherwise, become detached from one another, the apparatus of the cars still attached to the engine will retain their efficiency unimpaired.

In the attainment of these objects, this invention consists in the combination of a suitable electric bell placed upon the engine, which is so arranged mechanically and electrically that there can be no chattering or the giving of false signals from the violent jarrings of the locomotives when the generators are at rest; but when called into action, which is done in-

stantaneously, it operates distinctly, promptly and accurately. In the arrangement of the circuits the air tubes of the air brake apparatus are used as a support for the continuous conductor, and the metal joints of the said air tubes as the electrical conductor between the different sections or between the different cars, thus dispensing with the additional and complicated adjuncts in the process of train coupling. There is that attention to be paid in the construction which will render the apparatus to be in such condition that it will always be ready without failure, for the transmission of any signal desired to the engineer. The magneto generator in each car will occupy little room, and will be sightly and handsome in appearance.

Mr. Gilliland was requested by one of the prominent officers of the Pennsylvania Railroad Company to devise some such apparatus as is mentioned above for the purpose of signaling, their engineers finding that their conductors on the long passenger trains, running at a high rate of speed, had the greatest difficulty, at times, in getting the proper signal to the engine.

At many times there have been instances where signaling, especially on dark nights, would be of such advantage that safety to life and property would be very much enhanced by the adoption of this apparatus. It is simple, positive, costing nothing whatever to operate it, will last a lifetime, and will not, under any condition of atmosphere or circumstances, get out of order, requiring no attention beyond the ordinary care of any fixture.

From the very great number of inquiries that are now being received by Mr. Gilliland, there is evidently a very great want for something of this character, and those who are interested in such matters, and have examined the same, pronounce it just what is wanted, and that its early adoption by the entire railroad interests of the country is a foregone conclusion.

Mr. William Robinson, the inventor of several distinct systems of electric railway signals, notably that commonly known as the "Robinson Constant Circuit Rail System;" a system which has been already introduced on about thirty railroads in the United States, and is being rapidly extended. Mr. Robinson was the first man in the United States to devise a system of automatic electric signals which would work under passing trains, and he is the only man in any part of the world who has ever devised a system which certainly indicates to an approaching engineer the dangerous condition of the track ahead, by virtue of being occupied by a portion of some train broken loose, by a car being left on any part of the track, or by a broken or torn-up rail, by rails thrown across the track, or by other peculiar sources of danger. Indeed, so far as known, no one else has ever even attempted to meet these indispensable requirements of a safe signal service.

The Robinson electric railway signal system embodies automatic block signals, including overlapping signals, switch and drawbridge signals, road and grade-crossing signals, station-approach signals, yard signals, junction signals, broken and torn-up rail detectors, hand-key signals, repeaters, and all the various signals, visual and audible, required in railway service; the whole constituting the only system ever devised which meets the requirements of rapid, safe, and reliable railroading.

The Robinson system is now so well known among railroad men that a description of it is here unnecessary. The following facts, however, will be of interest to whom they may concern: In December, 1878, "The Union Electric Signal Company" was organized and incorporated for the purpose of owning and introducing the Robinson system of electric railway signals, the system thereafter becoming known as "The Union Electric Signal System." Mr. Robinson originally owned the whole of the capital stock of the Union Electric Signal Company, and received an equivalent for every share of it originally transferred to any one else.

Within a period of about two years and a half from the date of organization, the work of introducing the signals had been so successful that the stock of the company sold in the open market in Boston at above 375 per cent. of its original par value, that is at a premium of more than 275 per cent., and but little of it could be had at any price, the demand remaining unsupplied. This gives some idea of the pecuniary value of the Robinson system of electric railway signals.

A few months ago a syndicate of Western gentlemen, headed by George Westinghouse, Jr., Esq., of Pittsburgh, purchased the controlling interest in the Union Electric Signal Company. The company was then reorganized under the name of "The Union Switch and Signal Company," with George Westinghouse, Jr., as president, and with a capital of $1,500,000. An extensive and valuable property was purchased in Pittsburgh for a factory, and the Signal Works were at once removed from Boston to Pittsburgh. The new company absorbed "The Interlocking Switch and Signal Company" of Harrisburg, and removed the works of that company also to Pittsburgh. The Robinson electric signal system is now also known as "The Union Switch and Signal Company's System." It is being extensively introduced by that company and promises to become coextensive with railroads. It is proper to state that Mr. Robinson still receives a royalty on every signal erected by the Union Switch and Signal Company.

Messrs. Charles L. Knapp & Co., of Lowell, Mass., have recently established an office for the negotiation of Telephone Stocks, and have issued a very interesting catalogue, setting forth all the facts concerning the telephone business of special interest to investors in that field. We extract the following from their prospectus:

"We have opened an office in Lowell, devoting ourselves exclusively to operations in Telephone Stocks, and for the present, those known to the world at large as Lowell Telephone Stocks only. In this business we have been brought face to face with the public, and are compelled daily to answer questions concerning the Telephone and its working. We have been surprised to notice how little information the public at large were possessed of, concerning this wonderful invention and its marvelous development. With a view to economizing time, and to throwing light upon the subject, but with no purpose to excite undue or hasty investments, we present concisely some facts and figures in elucidation of this matter. It must be admitted by the most conservative, that the ultimate possibilities of the Telephone service remain undeveloped. With what has transpired during the past few months, this must be conceded. What an opportunity, then, for the investor, presents itself to-day, with the Telephone only in its infancy, Wonderful as the invention is as a triumph of art! its management and workings have afforded ample tests of reliability, and have shown a hardly less remarkable financial success. Some details of practical interest in the following pages are commended to public notice."

Room for Young Men.

THE SUGGESTIONS OF AN ELECTRICIAN IN REGARD TO THE STUDY OF ELECTRICITY.

"Why do not some of the young men who are crowding into the already overcrowded professions of law and medicine and journalism, take up the study of electricity?" said a London electrician and author of a book on electricity. "It is the only profession not overcrowded, because not a half a score of years ago the nature and powers of electricity were not known, and the extent of its aplication to commerce was not even dreamed of. Great fortunes are made in Europe in the profession of telegraph engineering. The Siemens brothers, who have residences in Berlin, Tiflis, St. Petersburg and London, are worth $5,000,000, all made in electrical engineering. Such men as Sir William Thompson, Latimer Clark, and Edison, who would be called inventors here, are, speaking more broadly, telegraph engineers. In Europe, young men and even women, are studying the science. Women are eminently fitted for its pursuit, as no physical labor is required.

"There are only four schools in the world for the study of the profession, one in Paris, one in Japan, and two in England. There should be one in New York city. The enormous extension of telegraph, telephone, electric light, and electric railway systems which is to be witnessed before many years in China and Japan, in Italy, Spain, Cuba, Brazil, and especially in this country, will demand skilled telegraph engineers, who will become wealthy in a few years. Ocean cables will also be multiplied in all parts of the world. The skill required in finding the place of a break in an ocean cable is possessed by telegraph engineers. They find the break with an instrument about as large as your hat. The time required for graduating from an electrical telegraph school is from two to four years, and a close study of electricity and mathematics is required."

A Treatise on the Transit Instrument as Applied to the Determination of Time. By LATIMER CLARK. Published by the Author, at 6, Westminster Chambers, London, S.W.

The author states that "the motive of this little work is a desire to introduce the transit instrument into more common use for purposes of utility and amusement, and more especially as a means of obtaining true time for the regulation of clocks and watches." To the uninitiated the contents of the book must look somewhat alarming at first, and one would not be surprised if the amateur purchaser on glancing at it, at once threw it aside as being far too deep for his comprehension. Actually, however, the difficulties to be overcome will be found to be very slight indeed, and we quite think that a large amount of very profitable amusement may be obtained by the help of the volume and the instrument it describes. The fact of the work being brought out by Mr. Latimer Clark must recommend it to the telegraph profession generally.—*Electrical Review.*

Electricity displaces oil in forty-two light-houses on the French coast.

M. Spring (Belgian Academy of Sciences) concludes that the seat of the electricity of storms is not, as generally admitted, in the moist region of the atmosphere, but in the cold and dry superstratum.

According to the *Coal Trade Journal*, the largest vein of coal in the world has recently been discovered in what was the Ute Indian reservation in Colorado. It covers 1,600 acres of land; the coal is semi-bituminous, of jet-black color, and almost entirely free from sulphur. It will smelt iron without coking, having been used by miners in the neighborhood for dressing their steel tools, and found superior to charcoal for that purpose.

Kate Field says the journalist "quietly accepts oblivion." We have known him to most enthusiastically seek for it when a citizen entered the sanctum with a club and announced his intention of pulverizing the entire staff. Just at the time when the journalist would accept it most gladly and quietly, oblivion is the hardest to find.

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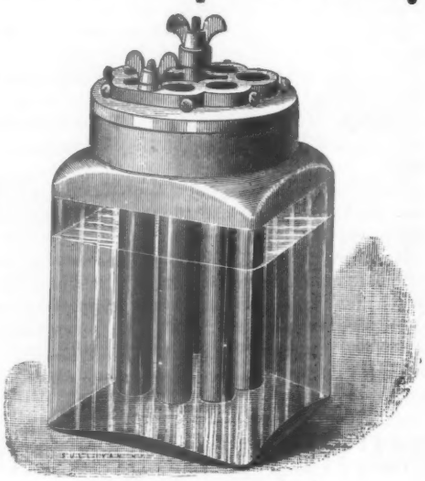

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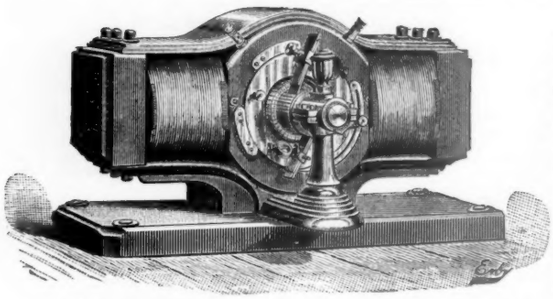

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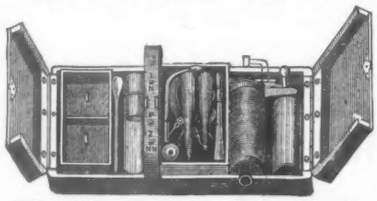

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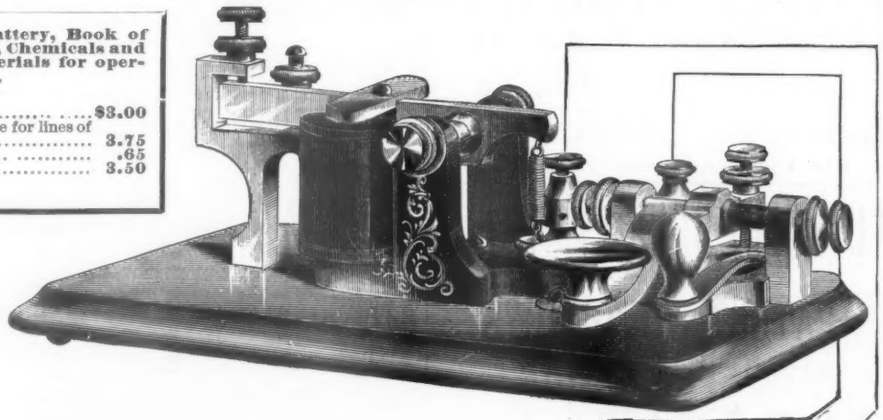

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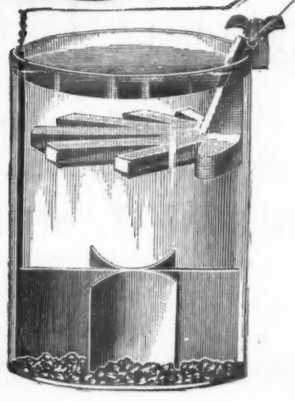

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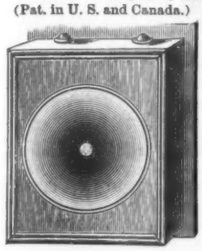

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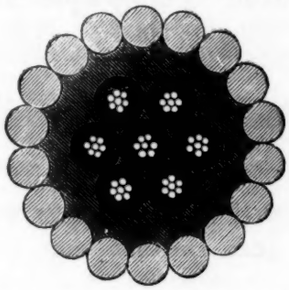

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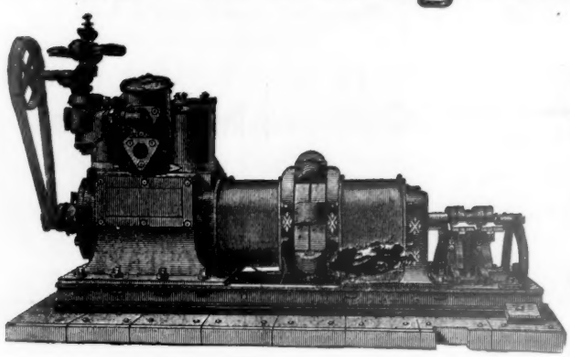

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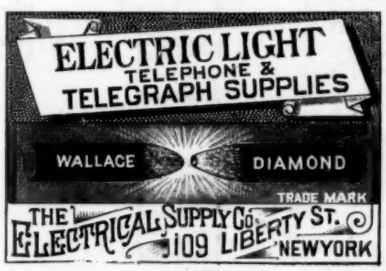

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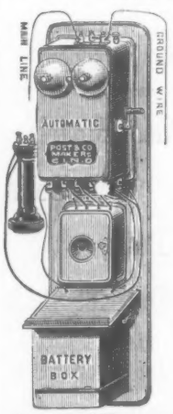

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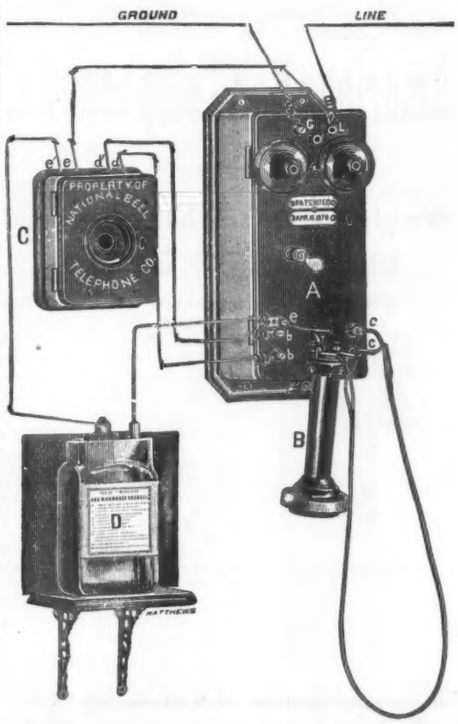

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